CS 111: Scientific Data and Dynamics

Spring 2019

Course Description: This course is an introduction to computational problem solving. Motivated by real-world problems, we will develop the ability to break complex problems down into simple pieces, produce efficient algorithmic solutions, and implement these solutions in *Python*. The course will cover programming fundamentals, as well as the development of algorithms and data manipulation techniques. No prior experience is necessary.

Course Learning Goals:

1. Practice how to break a complex problem into simple pieces. Develop analytic thinking skills.
2. Develop problem-solving skills. Build confidence in your abilities. Learn how to troubleshoot without becoming frustrated.
3. Develop an algorithmic way of thinking, including attention to the design and complexity of a solution. Learn to mold theory-based approaches to solve messy real-world problems.
4. Develop time management skills, metacognitive skills, and the habit of thinking intentionally about your learning and your goals.
5. Implement algorithmic solutions in Python as a proof of concept.
6. Develop group work skills, test-taking skills, the ability to write clear programs with helpful comments, and the ability to write to a general audience about technical material.
7. Develop comfort with the idea of writing as a way of thinking and understanding. Become proficient at re-writing as a way of communicating to your reader.

Class Details:

Instructor:	David White
Office:	Olin 202
Email:	david.white@denison.edu
Class:	9:30-10:20 MWF in Olin 217 **and** 8:00 - 8:50 Tuesdays
Drop-In Hours:	Mon 10:30 - 11:20, Tue 9:30 - 10:20, Wed 1:30 - 2:20, Fri 3-4, in Olin 202
TA Sessions:	Olin 217, Thursday night and Sunday night, times TBD
TA:	Available to help via e-mail and in person (fill-in):
Final:	9:00-11:00am, Wednesday, May 8, Olin 217
Web Resources:	http://personal.denison.edu/~whiteda/cs111spring2019.html
	http://codingbat.com/home/david.white@denison.edu/cs111spring2019
	NoteBowl: CS 111-01

Textbook: *Discovering Computer Science: Interdisciplinary Problems, Principles, and Python Programming*, by Jessen Havill.

Course Evaluation:

Homework	6%	Midterms & Quizzes	30%
Projects	35%	Reading Questions	6%
Participation	3%	Final Exam	20%

Grading Scale: A standard 10% grading scale will be used. Therefore, 60% is required to pass the class, 70% will be a C-, 80% will be a B-, and 90% will be an A-.

Keys to Success

- Prior to exams, be able to solve every quiz and homework problem quickly and with pen and paper rather than on the computer.
- Review the material from class the same day it is given. Find a way to attach this new knowledge to things you already understand.
- Read the textbook slowly and carefully, at your desk, with a notebook nearby to write down questions. Have Spyder open while reading. Type code in, play around, and experiment to figure out what Python can do. Answer all reflection questions.
- Start labs early. Give yourself time to get stumped and to get past these difficulties. Finish the programming part of the lab a full day before it is due so as to have time to write the lab report.
- Study computer science a bit every day rather than in bursts just before an exam.
- Keep a list of key definitions, built-in functions, and syntax, and commit them to memory throughout the course. Test your memory each week.
- Have a perfect, hand-written copy of each homework and quizzes within one day after the problems have been discussed in class. Use this to study for exams.

Exams will cover material presented in lecture, homework, and the textbook. The best way to study is to attend all class meetings, to do all homework problems, and to do practice problems I will give you. We will have three midterm exams, each worth approximately 10% of your final grade, and a cumulative final exam on May 8, 9-11am. **Please mark your calendars!**

Homework and Labs: We will have 5-6 labs which allow you to synthesize the skills of the previous unit in order to solve a real-world problem. Each lab is worth about 5% of your final grade in the course, and that grade is split evenly between the code and the lab report. You should write each lab report following guidelines I will give you. For each lab you will have a lab partner, with whom you do the coding. Partners should hand in identical code, and will receive the same grade on the coding part of the lab, except in cases of extreme free-riding. Part of the goal of the course is practicing your writing skills, so you are expected to hand in clear and readable lab reports, and leave detailed and useful comments on code. To give you time to spend on writing you should finish your code a full 24 hours before writing the lab report. I will not answer questions about code within 24 hours of the lab deadline. Late submissions will not be accepted. In consideration for sickness, personal emergencies, etc. I will drop the lowest lab grade.

Homework is meant to give you daily practice with Python. The coding exercises will be submitted through a website called CodingBat, which ensures that your code is correct before accepting your submission. In addition there will be practice problems which will not be collected but which you are encouraged to solve. Quiz and exam questions will often be drawn from homework and practice problems. The homework is meant to help you identify where you need more help. Homework is not meant to be stressful: all together the homework is worth less than 2 labs. If you find yourself spending more than 45 minutes per night on the homework, you should stop and ask for help (e.g. by emailing the course TA).

Collaboration on practice problems, homework, and labs is encouraged, but there are several rules. First, you must write up your lab report yourself, and cannot receive help from other students (about the lab report or about the questions in it). Secondly, it is an honor code violation to share code with your classmates. This includes code for CodingBat and for the lab (except you are allowed to share lab-related code with your lab partner). Thirdly, it is an honor code violation to look at code from any outside source, including

other students and the internet. It does not matter if you rewrite the code in your own words; as soon as you look at it, you've violated the honor code. An exception is code I give you, or code from the textbook.

Communication: It cannot be stressed enough how essential communication is to succeeding in this course. After identifying topics that may be giving you trouble, please communicate this information to me. There's no such thing as a bad or unwelcome question. Additionally, please communicate with each other. I view the class as a team trying to learn the material together. Collaboration will help all parties achieve this goal, as explaining concepts and examples to each other is a great way to learn. I am happy to answer questions, and I encourage you to come to my drop-in hours if you are confused about anything. You will get the most out of this time if you attempt the homework or lab first and come with questions already prepared. Please write down the drop-in hour times in your calendar, and try to keep these times free all semester long.

Reading: You are expected to keep up with the reading, and to complete the **reading questions** before class (they will be graded in-class or right after class, so do not forget to bring them with every day!). This will allow us to cover examples and applications in class that are different from the book, rather than rehashing what you have already read. While you read, work through the "reflections" included in the text, and practice implementing the concepts in Spyder. The best way to read the book is with a Spyder console open so that you can play with the new commands you're learning and see how they work. It's usually best to try to learn one new thing at a time, and working out the kinks in Spyder before starting the homework will deepen your understanding of the material. I'll start class by answering questions, so please ask if anything in the reading was unclear, or if you did not know how to answer any reflection questions. Sometimes we will have pop quizzes to check that you are doing the reading. If students are not reading, we might implement reading quizzes, as part of the daily homework grade. Expect to spend an average of 10-12 hours per week on average outside of class.

Final Project There will be a final project worth 2 labs, where students will apply the techniques learned in this class to a real-world problem of their choosing. You should start this project several weeks before it is due.

Course Format: It is essential to attend class. Please arrive on time or even early, as we will begin promptly. Class will begin with a review of old material and an introduction of new material. Please take advantage of this and use this time to ask questions on things that are confusing you, including the reading questions. We're all in this together and don't want to leave anyone behind. We will then have a block of time for in-class programming to make sure we understand the implementation of the concepts discussed in the lecture and reading. Working on problems in class will give you a chance to identify things which may cause confusion on the homework and ask for clarification while we are all in the same room. Please bear in mind that when you choose to miss a portion of class, by arriving late, getting up to use the bathroom in class, or texting a friend during class, you are depriving yourself of an important part of your education.

Participation: Class meetings will be highly interactive and our goal will be to involve all participants. Attending class, answering questions, and asking questions is therefore essential and will be a significant factor in determining your participation grade. There will also be periodic group exercises which will factor into your participation grade, as will your ability to work well with your partner(s). Each day participation will be graded on a scale from 0-3, with 0 signifying an absence, 2 attending attentively, and 3 active participation such as asking or answering a question. An absence does not excuse students from the responsibility to submit homework and labs on time. Students are responsible for making up any content covered in class while they are absent. If a student misses a class on which a quiz is given, the student shall receive a zero on the quiz. This includes pop quizzes, whose dates are not announced ahead of time.

Disability: Any student who feels he/she may need an accommodation based on the impact of a disability should contact me privately as soon as possible to discuss his/her specific needs. I rely

on the Academic Resource Center to verify the need for reasonable accommodations based on documentation on file in that office.

Academic Integrity: The students and faculty of Denison University and the Department of Mathematics and Computer Science are committed to academic integrity and will not tolerate any violation of this principle. Academic dishonesty is, in most cases, intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from daily homework assignments to major exams. Students must clearly cite any sources consulted, including classmates who have been collaborators on the homework and online sources of aid. As is indicated in Denison's Student Handbook, instructors must refer every act of academic dishonesty to the Associate Provost, and violations may result in failure in the course, suspension, or expulsion.

I expect that you will all abide by the honor code in this course. Please do not use resources outside of me, your fellow students, the tutors, and the textbook. Students are not allowed to copy code from online sources, and should not search for solutions online. Collaboration on homework and projects is permitted, but you are not allowed to share code, except with your assigned lab partner. You may discuss the problems with each other and the tutors, but when you leave you should not have any written or typed notes from those you collaborated with. Collaboration on quizzes and exams is not permitted. Violations of the honor code will be reported and may result in severe penalties, including failure of the course.

Appropriate Use of Course Materials: The materials distributed in this class, including the syllabus, exams, handouts, study aides, and in-class presentations, may be copyrighted and hence will be governed by the provisions of U.S. copyright law. These materials are provided solely for the educational use of students enrolled in this course. You are not permitted to re-distribute them for purposes unapproved by the instructor; in particular you are not permitted to post course materials or your notes from lectures and discussions online, or to share them with individuals outside the class (including future students). Unauthorized uses of course materials will be considered academic misconduct as well as a breach of copyright law.

Multilingual support: In addition to the academic support services available to all Denison students, students who use English as a second (or third, etc.) language, can meet with Denison's Interim Coordinator of Multilingual Learning, Kalynda Thayer. She offers a variety of support for students, from consulting with you about your written work to helping you devise strategies for developing and effectively using your listening, speaking, reading, and writing skills in English. You can email her at kalynda.thayer@denison.edu to schedule an appointment

Email: I will frequently contact you via email. Please check your email regularly. I will also check my email regularly, but often not after 7pm. Experience has shown that students who begin labs early are much more successful, while those who try to do it the night before are unable. Thus, I will not respond to questions about labs within 24 hours of the due date, because I do not want to enable students who wait till the last minute to begin.